ClimaRice Technical Brief # 6 -2011

Mobile technology for climate change adaptation in agriculture

CLIMARICE II: **"Sustaining rice production in a changing climate"**

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ClimaRice II is exploring the potential for use of mobile technologies in the context of climate change adaptation in agriculture. Modern mobile telephone technology is a key component of the ongoing communication revolution which in turn has great potentials for social change and development. The Indian telecommunication industry[1][2][3] is the world's fastest growing industry with 811.59 million mobile phone subscribers as of March 2011[4]. Most farmers are already using mobile phones for various day to day needs, but the technology has a wider potential in supporting their main profession; agriculture. Linking mobile technology with adaptation measures developed in ClimaRice projects could form new and powerful measures to meet the threats from climate change and provide support in sustaining rice production.

Mobile technology as an interactive information exchange and dissemination platform for farmers

Farmers deal with day to day variability in weather conditions. This adaptation of farmers, e.g. towards weather forecasts, could be viewed as a short term analogy to the long term adaptations to climate change. Improved access to weather forecasts and other relevant warnings of weather driven events relevant to rice cropping is another priority of ClimaRice II.

ClimaRice II development of pest & disease forecasting will target the mobile platform

One of the uses of mobile technology developed under ClimaRice is the development of Pest and Disease. Agrometeorological weather networks are currently being built in several Indian states. In Tamil Nadu state the number of automatic weather stations has passed two hundreds. The ClimaRice II project will develop a pilot rice disease forecasting service linked to this network, to provide early warnings on rice disease attacks.

Photo: Early detection of pest damage on rice leaves

Figure: TamilNadu Agricultural Weather Network web page shown in a smartphone internet browser (in Tamil language)

Survey data collection with mobile phones

As a first step ClimaRice II researchers are using mobile technology to collect field research data when taking observations and conducting survey interviews in the field.

The major advantages of a work flow based on mobile field data collection is that the sampled data can be directly posted from the field and stored in an online central database, reducing the risk of data loss. The integrated support for determining geographical position (GPS) automates the procedure of associating such information with the observations taken. The location information can also be used for quality control, e.g. to check whether the observations are taken in accordance with a predefined sampling plan. In addition to improving quality and efficiency of field data collection, we expect to gain further valuable experience about performance of mobile phones under tropical field conditions. Important aspects that will be considered are battery capacity under operational data collection, network coverage, screen visibility etc.

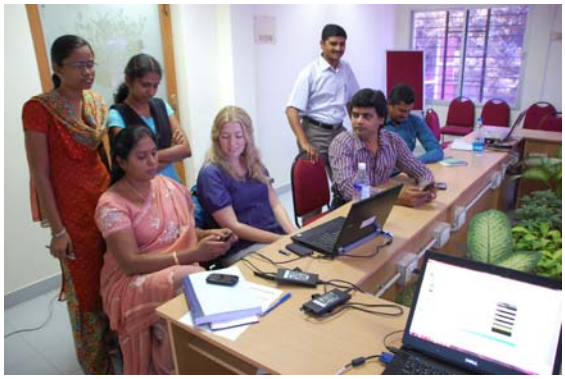

Photo: Mobile technology workshop

Following a workshop held in Tamilnadu Agricultural University, Coimbatore, the International Water Management Institute (IWMI) a partner in ClimaRice II project together with Bioforsk, Norway, has collected farmer details using mobile technology for Jonnalagadda Village, Guntur rural mandal, Guntur district, Andhra Pradesh, India (see figure in next column). The village is located about 10 kms from the Regional Agricultural Research Station, Lam under the ANGR Agricultural University . The village has about 3000 acres of land with paddy, cotton, chillies and blackgram as the main crops.

The same methodology will be tested in ongoing ClimaRice II surveys monitoring the occurrence of rice pests and diseases in several villages using smart phones.

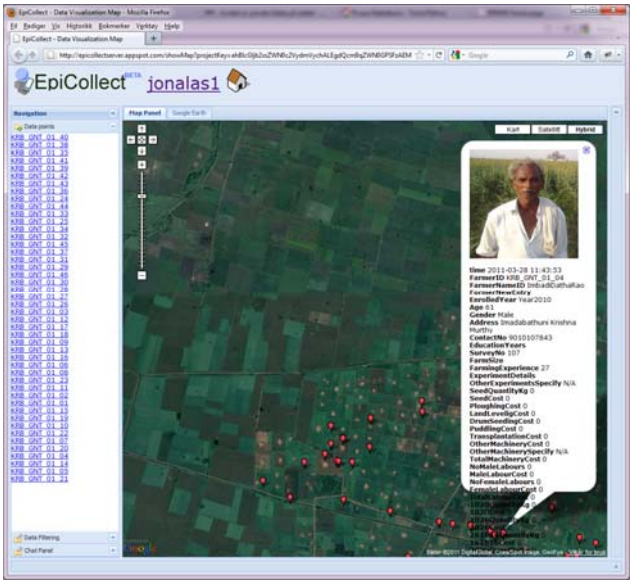

Figure: Screendump showing results from surveys conducted in the field outside the Jonalagada Village using mobile phone and the open source mobile software EpiCollect[5].

Figure: Selection of a smartphone for field use should give priority to battery capacity to allow full working days. Price is another relevant factor as field usage usually will be rough.

Although smartphones are still expensive, the availability of an open source operating system, the Android, is an advantage that any producer can use in their products. This is likely to push prices down quite rapidly and give way for easy affordability to Indian farmers.

Mobile technology concepts

Global Positioning System (GPS) is a space-based global navigation satellite system (GNSS) that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites

GPS-phones and the power of real-time positioning networking can now be utilized to a larger extent as GPS is becoming a standard functionality of many mobile phone models. The opportunities arising when hooking a GPS on the Internet are great. Improved risk management, new workflows as well as new possibilities for public participation and stakeholder interaction are key factors for how this technology can drive social change[6]. Mobile telephones with integrated GPS units are the first kind of mass produced handheld devices supporting online transmission of georeferenced data. When the same devices also are equipped with microphones and cameras supporting rich media like audio, photo and video, the possibilities become enormous.

Location-based service (LBS) refers to an information service, accessible with mobile devices through the mobile network and utilizing the ability to make use of the geographical position of the mobile device. Early warning and forecasting services for the risk of plant pest and disease attacks will be suitable as LBS.

Mobile field data collection refers to activities where observations made in the field can be synchronized in real time to central databases. This technology can be extended with subsequent actions triggered automatically or manually, sensitive to the information reported from the field. This workflow principle has been termed "*Smart Reporting*" in a Norwegian pilot study developing an automatic system for handling events threatening food safety[4].

Existing mobile services for farmers

The Tamil Nadu Agricultural University (TNAU) has developed the TNAU Agritech Portal providing many information services to farmers. One example is the TNAU weather service web providing both weather forecasts and observations from the Tamil Nadu Agricultural Weather Network. Another example that is more adapted to mobile telephones is the Dynamic Market Information where farmers can subscribe by SMS, email or both, to receive daily market prices/support prices of vegetables, fruits, plantation crops, flowers and spices for different markets in Tamil Nadu. One important advantage of SMS is its availability for even the simplest and low cost phones.

Research and development in ClimaRice will study the combined power of Short Message Service (SMS) with the possibilities provided by internet browsers on modern mobile phones for dissemination of weather driven early warnings of rice disease.

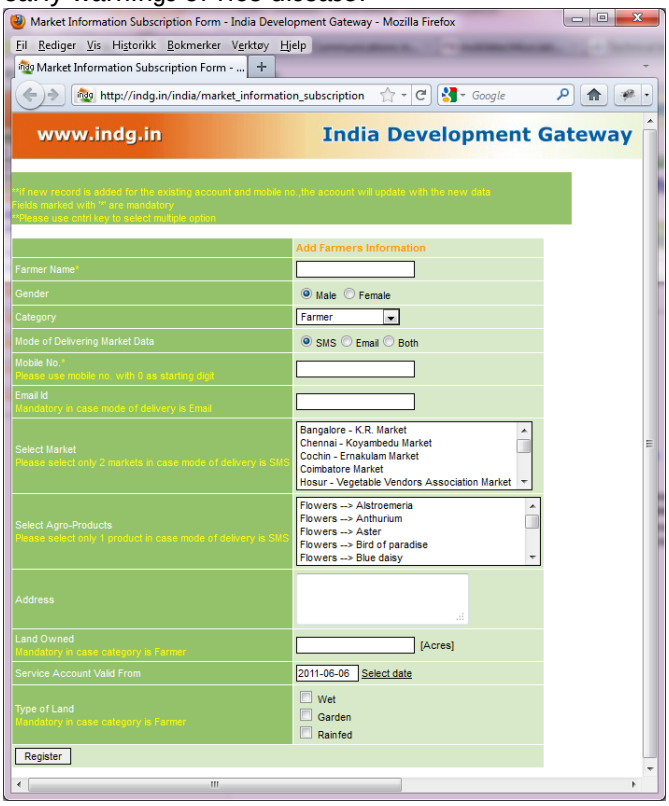

Figure: Subscription page for farmers to receive Dynamic Market Information.

Technology basis and previous experience

Bioforsk has experience with two different softwares for recording field data or events with GPS-equipped mobile telephones. The first one is "Spatial Mobile Information and

Location based Experience" (SMILEX) a commercial java-based software developed in Norway. SMILEX has been tested extensively in Norway and has been in operational use for plant disease surveys commissioned by the Norwegian Food Safety Authority since 2008[6]. Although SMILEX is based on java and consequently an idea of platform independence, the lack of standards compliance among the various producers of mobile phones put constraints on this aspect. In practice SMILEX has been used mostly on Nokia phones running the Symbian operating system.

The second software is named EpiCollect[5]. With the rapid development and popularity of more advanced mobiles over the last years, the smartphones, many new possibilities have emerged. Of key importance is the fact that smartphones to a larger extent invites independent software developers to create new applications. One such application is EpiCollect which is made for epidemiology, ecology and community data collection, currently available for both the Android and iPhone smartphone platforms[5]. Bioforsk has tested EpiCollect to some extent, and customized it to collect data to the existing Climarice.org server. Mobile technology task in ClimaRice II project both is not only a science support tool but also a means to facilitate interaction between farmers and other stakeholders in the agricultural sector in order to open new possibilities for climate change adaptation.

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ClimaRice II Project (2009-2011)

ClimaRice II is an integrated project that aims to test and validate climate change adaptation techniques related to rice production, in close co-operation with farmers and local agencies in two study areas in the Cauvery River Basin, Tamil Nadu, and Krishna River Basin, Andhra Pradesh, in India.

The overall goal is to contribute to the regional and national adaptation strategies to sustain rice production and ensure food security amidst changing climate. The partners are:

- Bioforsk - Norwegian Institute for Agricultural and Environmental Research (Project Co-ordinator)
- Tamil Nadu Agricultural University, Coimbatore, India
- International Pacific Research Institute, Hawaii, USA
- International Water Management Institute, Hyderabad, India

The project is funded by the Norwegian Ministry of Foreign Affairs/The Norwegian Embassy, New Delhi.

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